

In the Specification:

Please amend the specification as follows:

Page 1, first paragraph:

Cross-reference to related applications

This application claims priority to Finnish patent application 20035223 filed 27 November 2003 and is the national phase under 35 U.S.C. § 371 of PCT/FI2004/050175.

Field of the Invention

The present invention relates to a circuit board with at least one substrate layer and at least one optical channel. The invention also relates to a method for manufacturing a circuit board, in which the circuit board is provided with at least one substrate layer and at least one optical channel. The invention further relates to a method for manufacturing a layer of a circuit board in a continuous process, in which the circuit board is provided with at least one substrate layer and at least one optical channel.

Background of the Invention

Page 2, first paragraph:

Summary of the Invention

It is an aim of the present invention to improve the prior art and to provide a method for manufacturing a circuit board as well as a circuit board. The invention is based on the idea of providing the circuit board with at least one plastic layer and providing it with at least one optical channel. To put it more precisely, the circuit board according to the present invention is primarily characterized in that at least one substrate layer of the circuit board is made of plastic, and in the shaping of the substrate layer, a mould has been used, that the substrate layer is provided with a shape which substantially corresponds to the shape of the optical channel, and that the optical channel is formed in said shape provided in the substrate layer. The manufacturing method according to the present invention is primarily characterized in that at least one substrate layer of the circuit board is made of plastic, and for shaping the substrate layer, a mould is used, by which the substrate layer is provided with a shape which substantially corresponds to the shape of the optical channel, and that the optical channel is formed in said shape provided in the substrate layer. The method for manufacturing a circuit board in a continuous process according to the present invention is primarily characterized in that at least one substrate layer of the circuit board is made of plastic, and for shaping the substrate layer, a mould is used, by which the substrate layer is provided with a shape which substantially corresponds to the shape of the optical channel, and that the optical channel is formed in said shape provided in the substrate layer.

Paragraph bridging pages 2 and 3:

The present invention shows remarkable advantages over solutions of prior art. In the circuit board according to the invention, the thermal expansion coefficients obtained for the optical channel and the circuit board are substantially equal, wherein variations in the temperature do not significantly cause stress states in such a circuit board. Furthermore, the coupling of the signal obtained between the optical channel and the optical transmitter/receiver is efficient, because the design of the channel and the coupling element (*e.g.* a bevelled surface) can be provided already in the mould design, wherein the channel is provided with the desired shape without separate work stages during the manufacturing. Furthermore, the material of the substrate can be selected so that it meets the requirements for the cladding of the optical channel, thereby making it possible to exclude a separate cladding and to provide a simpler structure and manufacturing method. Moreover, the optical layer can be used as a substrate for electrical couplings, and a separate intermediate layer will not be needed to join the optical layer and the electrical layer. The use of a thermoplastic as the substrate for the circuit board also provides relatively easy processability, for example, by hot casting, injection moulding and mechanical processing methods. The materials used in the manufacture of the circuit board according to the invention are recyclable. Furthermore, the circuit board according to the invention can be provided with very small-sized electrical and optical microvias between any layers.

Brief Description of the Drawings

Page 4, second full paragraph:

Detailed Description of Embodiments of the Invention

In the following example, we shall describe the steps of the manufacturing method according to an advantageous embodiment of the invention for manufacturing a circuit board 1 according to Figs. 1a and 1b. It is obvious that the example showed herein is only one possible circuit board structure, but in practical applications, it is possible to implement very different circuit boards.

To illustrate the invention, Fig. 1a only shows some components 7, 8, 9 as well as optical channels 3 and electrical wirings 5. The number of layers as well as components to be placed on the circuit board may vary in practical applications.